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Ohio Supercomputer Center

Introducing Computational Science in the Curriculum

Steven I. Gordon
Senior Director of Education and Client Services
Ohio Supercomputer Center
sgordon@osc.edu



Overview

- Context for the course
- Course objectives
- Description of pedagogy
- Plan for the workshop
- Work through and discuss course examples

Download Example Datasets and Exercises

- <https://osc.edu/~sgordon/sc12>
- Follow the instructions on that page
- Will allow you to undertake the some of the sample exercises during this workshop

Context for the Course

- Part of minor program in computational science at eight Ohio institutions
 - Interdisciplinary minor for majors in science and engineering disciplines begun in 2009-2010
 - Worked to create a set of competencies that represent a consensus of the computational science skills that undergraduate students should have
 - Provides framework for shared courses and course materials across institutions
 - Working with NSF XSEDE project to create graduate level competencies
 - <http://www.rscs.org/competencies>

Courses for Undergraduate Minor

Simulation and Modeling

Programming and Algorithms

Differential Equations and Discrete Dynamical Systems

Numerical Methods

Optimization

Parallel Programming

Scientific Visualization

One discipline specific course

Capstone Research/Internship Experience

Discipline Oriented Courses

Objectives for Simulation and Modeling Course

- Explain the role of modeling in science and engineering
- Analyze modeling and simulation in computational science
- Create a conceptual model
- Examine various mathematical representations of functions
- Analyze issues in accuracy and precision
- Understand discrete and difference-based computer models
- Demonstrate computational programming utilizing a higher level language or modeling tool
- Assess computational models
- Understand the differences among verification, validation, and accreditation
- Complete a team-based, real-world model project
- Demonstrate technical communication skills

Detailed competencies

- Let's review the detailed competencies for the course together
- In your SC12 downloaded folder – Introduction to Modeling Competencies.pdf

Questions

- Any questions before we move on?

Course Pedagogy

- Short presentations on concepts, definitions, and examples
- Activities to reinforce and apply the knowledge
- Build computing skills as needed to complete the exercises
 - This example uses MATLAB
 - Could be adjusted to any programming or high level language
 - Will share the codes and provide some compiled examples for us to work through together

Remaining Agenda

- Review entire course outline
- Go through selected exercises
 - Hands-on use of completed models to demonstrate learning objectives
 - Brief overview of the coding principles but not a review of MATLAB programming skills
- Provide exercises and codes that you can use directly or adapt for your classes
- Review related XSEDE program services that you may be able to take advantage of